

Bacteria and Benthic TMDLs in Occoquan Watershed Stream Segments

Public Meeting#1
March 30, 2005



INTRODUCTION

What is a TMDL ?

Total Maximum Daily Load

TMDL - *Total Maximum Daily Load*

- A TMDL is a **pollution budget** of how much pollution a waterbody can receive and still meet Water Quality Standards.
- A TMDL is a study done under Federal and State law.
- TMDLs are under way all over the U.S.
- Almost 1000 TMDLs are being done in Virginia (1999-2016).

Overview of Presentation

- I. Provide background on the water quality assessment process, and how waters are listed as impaired
- II. Discuss the Occoquan Streams impairments to be addressed in this TMDL study
- III. Provide overview of the TMDL process

I. Background on the water quality assessment process and how waters are listed as impaired

305(b) Assessment and 303(d) Listing Processes

- VDEQ monitors and assess water quality for the 305(b) Report.
- Any waters not meeting Water Quality Standards are placed on the 303(d) List.
- A TMDL must be developed for each listed water.



Water Quality Standards

Water Quality Standards (WQS)
are the basis
for the listing of impaired waters
and TMDL development

Water Quality Standards

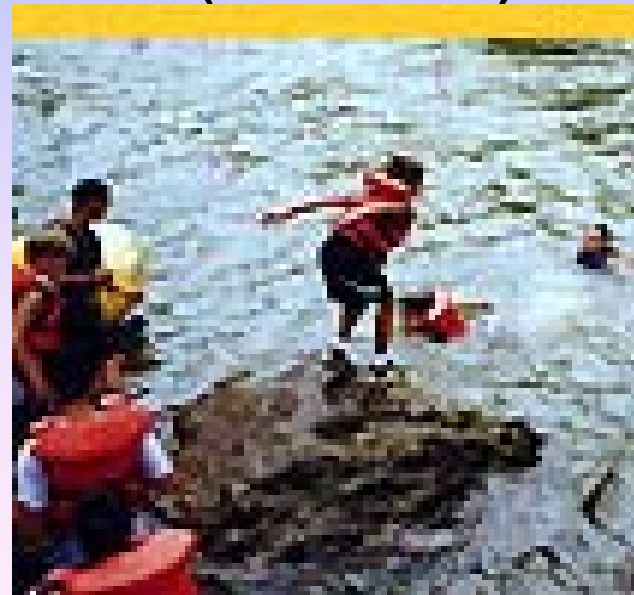
Water Quality Standards (WQS) are regulations based on federal and state law that:

- set **numeric** and **narrative** limits on pollutants
- consist of **designated use(s)** and water quality **criteria**

Water Quality Standards

Purpose of WQS:

- **protection** of the designated uses of state waters
- **restoration** of state waters (TMDLs)



Designated Uses

- All Virginia waters are designated for:
 - aquatic life
 - fishing and fish consumption
 - primary contact recreation (swimming)
- Appropriate Virginia surface waters are also designated for:
 - shellfish
 - drinking water



Applicable Designated Uses

The Occoquan Basin study addresses:

- primary contact recreation
- aquatic life use

Applicable Designated Uses

- For primary contact recreation use, waters are assessed using fecal coliform and *E. coli* bacteria measurements.
- For aquatic life use, waters are assessed using various water quality data measures and biological monitoring.

Assessment Methodology: Recreation

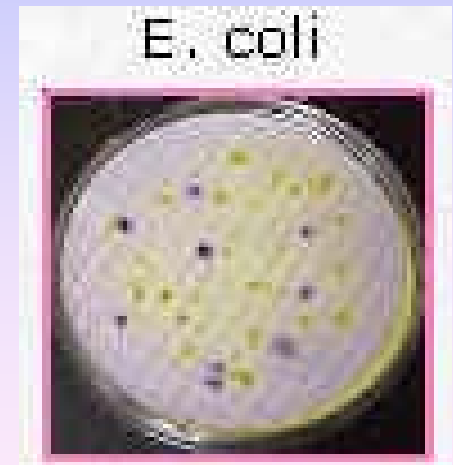
Fecal coliform bacteria and E. coli bacteria

- **Fecal bacteria** are found in the digestive tract of humans and warm blooded animals
- Fecal bacteria are an **indicator** of the potential **presence of pathogens** in waterbodies
- The presence of fecal bacteria in water samples is a strong indicator of recent **sewage or animal waste contamination**

Assessment Methodology: Recreation

Fecal coliform bacteria and E. coli bacteria

- For freshwater, there has been a change in indicator species of bacteria, from fecal coliform to ***E. coli***
- ***E. coli*** bacteria are a **subset of fecal coliform** bacteria
- *E. coli* correlates better than did fecal coliform with swimming-associated illness



Summary of Changes in Primary Contact Criteria

Indicator	Status	Instantaneous Maximum (cfu/100mL)	Geometric Mean (cfu/100 mL)
Fecal Coliform	Old	1,000	200
<i>E. coli</i>	New	235	126
Fecal Coliform	Interim	400	200

- Changes went into effect on January 15, 2003
- Both New *E. coli* and Interim Fecal Coliform criteria apply
- Fecal coliform criteria will be phased out entirely once 12 *E. coli* samples have been collected, or after June 30, 2008

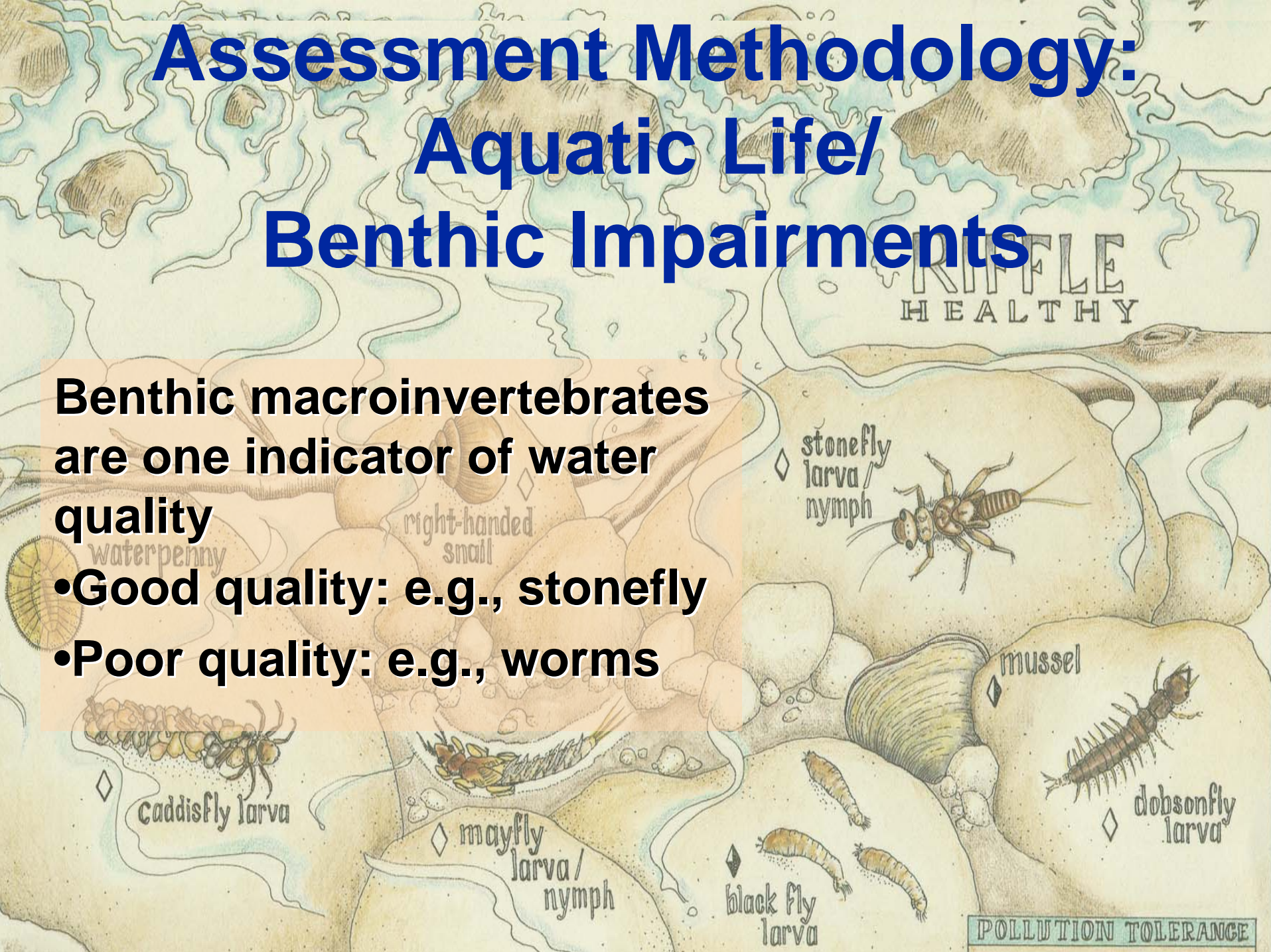
Assessment Methodology: Aquatic Life/ Benthic Impairments

- Based on benthic macroinvertebrate biological monitoring data
- Follows EPA Rapid Bioassessment Protocols (RBPII)
- Later monitoring will transition to the Streams Condition Index (SCI) method, once this methodology is approved

Assessment Methodology: Aquatic Life/ Benthic Impairments

**Benthic macroinvertebrates
are one indicator of water
quality**

- **Good quality: e.g., stonefly**
- **Poor quality: e.g., worms**



II. The Occoquan Streams TMDL



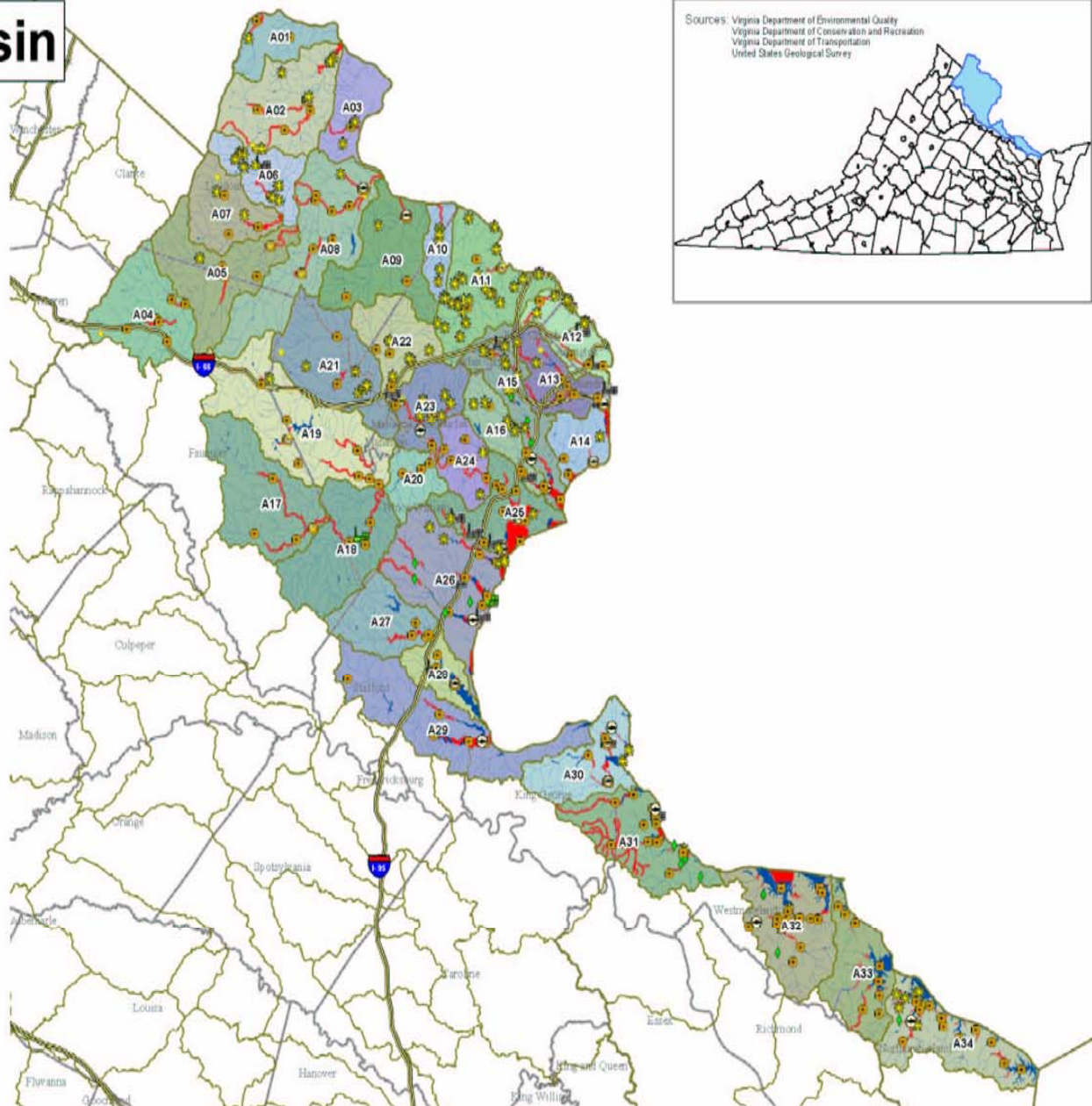
Potomac River Basin

Monitoring Stations

-  Ambient
-  Ambient/Biological
-  Ambient/Biological/Fish Tissue
-  Ambient/Federal
-  Ambient/Federal/Fish Tissue
-  Ambient/Fish Tissue
-  Biological
-  Biological/Fish Tissue
-  Citizen Monitoring
-  Federal
-  Fish Tissue

NPDES Dischargers

-  Industrial
-  Municipal
-  Interstate
-  Watersheds
-  Impaired Rivers and Streams
-  Impaired Reservoirs and Estuaries



Sources: Virginia Department of Environmental Quality
Virginia Department of Conservation and Recreation
Virginia Department of Transportation
United States Geological Survey





Impairments in the Upper Occoquan Watershed

Stream	County/City	Length (mi.)	Year Listed	Impairment
Broad Run	Prince William	1.51	2002	Bacteria
Broad Run	Prince William	7.26	2002	Bacteria
Broad Run	Prince William	1.06	2004	Bacteria
South Run	Fauquier, Prince William	2.34	2004	Bacteria
		2.34	1996	Benthic
Kettle Run	Prince William	7.59	2002	Bacteria
Occoquan River	Prince William	1.61	2004	Bacteria
Little Bull Run	Prince William	3.03	2004	Bacteria
Bull Run	Prince William, Fairfax	4.80	2004	Bacteria
		4.80	1996	Benthic
Popes Head Creek	Fairfax	4.92	2004	Bacteria
		4.92	1998	Benthic

Occoquan Streams

2004 Water Quality Assessment

Results for Bacteria

TMDL_ID	WB_NAME	Monitoring Station	Location	Fecal Coliform	
				Exceedences/ Samples	%
VAN-A19R-01	Broad Run	1ABRU001.59	Rte. 692	1/ 6	16.7%
VAN-A19R-02	Broad Run	1ABRU007.58	Rte. 28	4/ 19	21.1%
VAN-A19R-02	Broad Run	1ABRU020.12	Rte. 29/15	7/ 18	38.9%
VAN-A19R-05	Broad Run	1ABRU024.74	Rte. 628	2/ 5	40.0%
VAN-A19R-03	Kettle Run	1AKET000.80	Rte. 619	8/ 20	40.0%
VAN-A19R-03	Kettle Run	1AKET002.06	Rte. 611	1/ 5	20.0%
VAN-A19R-04	South Run	1ASOT001.44	Rte. 215	5/ 18	27.8%
VAN-A20R-01	Occoquan River	1AOCC024.74	Rte. 234	4/ 16	25.0%
VAN-A21R-01	Little Bull Run	1ALII003.97	Rte. 705	2/ 17	11.8%
VAN-A23R-01	Bull Run	1ABUL010.28	Rte. 28	4/ 34	11.8%
VAN-A23R-02	Popes Head	1APOE002.00	Rte. 645	3/ 20	15.0%

A greater than 10.5% exceedance rate with a minimum of two exceedances results in an impairment listing.

What does a “Bacteria Impairment” mean to me?

According to VDH:

- Most of the organisms in Virginia’s natural waters do not cause illness, but there is no way to be sure in any particular waterway.
- The most common waterborne illnesses are gastrointestinal; also potential for skin, eye, and ear infections.
- Avoid ingesting water from natural streams, rivers, and lakes *anywhere*.

What does a “Bacteria Impairment” mean to me?

Primary Contact Recreation

According to VDH:

- Swimming in natural surface waters in much of the U.S. can pose some risk, especially to the very young, very old, those with cuts in their skin, and the immuno-compromised.

What does a “Bacteria Impairment” mean to me?

Water Supplies

- Public water supplies (Lake Manassas and the Occoquan Reservoir) are monitored by the water utility as required by USEPA.
- All public drinking water supply (“finished water”) is disinfected.
- Individual drinking water wells are rarely contaminated by bacteria, but VDH recommends periodic testing, especially of older wells.

Occoquan Streams Benthic Impairments

- The three benthic-impaired streams have been under ongoing biological monitoring
 - South Run and Bull Run 1994-2000, 2004→
 - Popes Head Creek 1997-2000, 2004→
- South Run and Bull Run first listed in 1996. Popes Head Creek first listed in 1998.
- Reference sites
 - Catoctin Creek used for South Run and Popes Head Creek
 - Rapidan River used for Bull Run

FEB 2

What does a “Benthic Impairment” mean to me?

Fishing

- A benthic impairment of itself does not mean the fish are unsafe to eat.
- If you fish and do not “catch and release”, find fish consumption advisory information at the Virginia Department of Health website:

www.vdh.state.va.us

What does a “Benthic Impairment” mean to me?

Ecosystem

- Benthic impairment means the waterbody is not sustaining as complex an ecosystem as it would otherwise.
- It is important for Virginia to maintain a healthy basis for aquatic life in our waterways.

III. Overview of the TMDL process

Virginia TMDLs

- Clean Water Act §303(d) and 40 CFR §130.7 requires development of TMDLs
- In 1999, EPA signed a Consent Decree with lawsuit Plaintiffs, agreeing to develop TMDLs in Virginia
- VDEQ is required to develop TMDLs and Implementation Plans (IPs) under state statute (WQMIRA)

(Water Quality Monitoring, Information, and Restoration Act)



What is a TMDL ?

Total Maximum Daily Load

A TMDL is a **pollution budget**:

$$\text{TMDL} = \text{Sum of WLA} + \text{Sum of LA} + \text{MOS}$$

Where:

TMDL	=	Total Maximum Daily Load
WLA	=	Waste Load Allocation (point sources)
LA	=	Load Allocation (nonpoint sources)
MOS	=	Margin of Safety

Required Elements of a TMDL

A TMDL must:

- be developed to meet Water Quality Standards
- be developed for critical stream conditions
- consider seasonal variations
- consider impacts of background contributions
- include wasteload and load allocations (WLA, LA)
- include a margin of safety (MOS)
- be subject to public participation
- provide reasonable assurance of implementation

TMDL Development Methodology

- Identify all types of sources of a given pollutant within the watershed
- Calculate the amount of pollutant entering the stream from each source type
- Calculate the pollutant reductions needed, by source, to attain Water Quality Standards
- Allocate the allowable loading to each source and include a margin of safety

TMDL Implementation

- After the TMDL study is accepted by USEPA:
 - **point sources** (WLA) are addressed through the permit process
 - **nonpoint sources** (LA) are addressed through an Implementation Plan (IP).
- The Implementation Plan takes place in stages.
- DCR is lead agency for the TMDL Implementation Plans.
- DEQ conducts ongoing monitoring to evaluate changes/improvements to water quality.

Roles of DEQ and DCR in TMDL Development

- DEQ is the lead for TMDL development
- DEQ is responsible for ensuring public participation and submitting TMDLs to EPA for approval
- DEQ is responsible for reductions in the permitted sources component (WLA) (excepting MS4 and E&S)

Roles of DEQ and DCR in TMDL Development

- DCR is the lead for
 - TMDL Implementation Plans
 - implementation of nonpoint source (LA)
 - implementation of MS4 (urban stormwater) and construction E&S permits

Role of the TAC in TMDL Development

- A Technical Advisory Committee (TAC) is representing the interested agencies, utilities, and local governments. The TAC will:
 - review data, methods, processes
 - advise VDEQ of technical issues
 - assist with public outreach process
 - TAC meetings are published in the Virginia Register and are open to the public

Role of the Public in TMDL Development

- The public is asked to:
 - Stay involved, stay informed!
 - Let us know specific things about your watershed.
 - Review draft reports as they are issued, and provide your comments on them during the comment period.
 - Contact your local government or interested agency for further technical input.
 - Continue to be good stewards of the watershed.

Bacteria and Benthic TMDLs in Occoquan Watershed Stream Segments

<http://www.deq.virginia.gov/tmdl/>

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Occoquan Streams TMDL Technical Advisory Committee Members

Local Government

City of Alexandria

City of Manassas

City of Manassas Park

Fairfax Co. DPWES

Fairfax Co. Office of Comp. Planning

Fairfax Co. Health Dept.

Fauquier Co. Community

Development

Loudoun County Public Works

Prince William Co. Dept. of Health

Prince William Co. Planning Office

Prince William Co. Public Works

Water and Wastewater Utilities

Fairfax Water

Fauquier Water & Sanitation
Authority

Loudoun Co. Sanitation Authority

Prince William Co. Service Authority

Upper Occoquan Sewage Authority

Agricultural Agencies (state, federal, regional)

Fauquier-Pr Wm Farm Service Agency

John Marshall Soil & Water Cons. Dist.

Loudoun Soil & Water Cons. Dist.

Northern Virginia Soil & Water Cons.
Dist.

Prince William Soil & Water Cons. Dist.

Occoquan Watershed Monitoring Lab

Water and Wastewater Utilities

Fairfax Water

Fauquier Water & Sanitation Authority

Loudoun Co. Sanitation Authority

Prince William Co. Service Authority

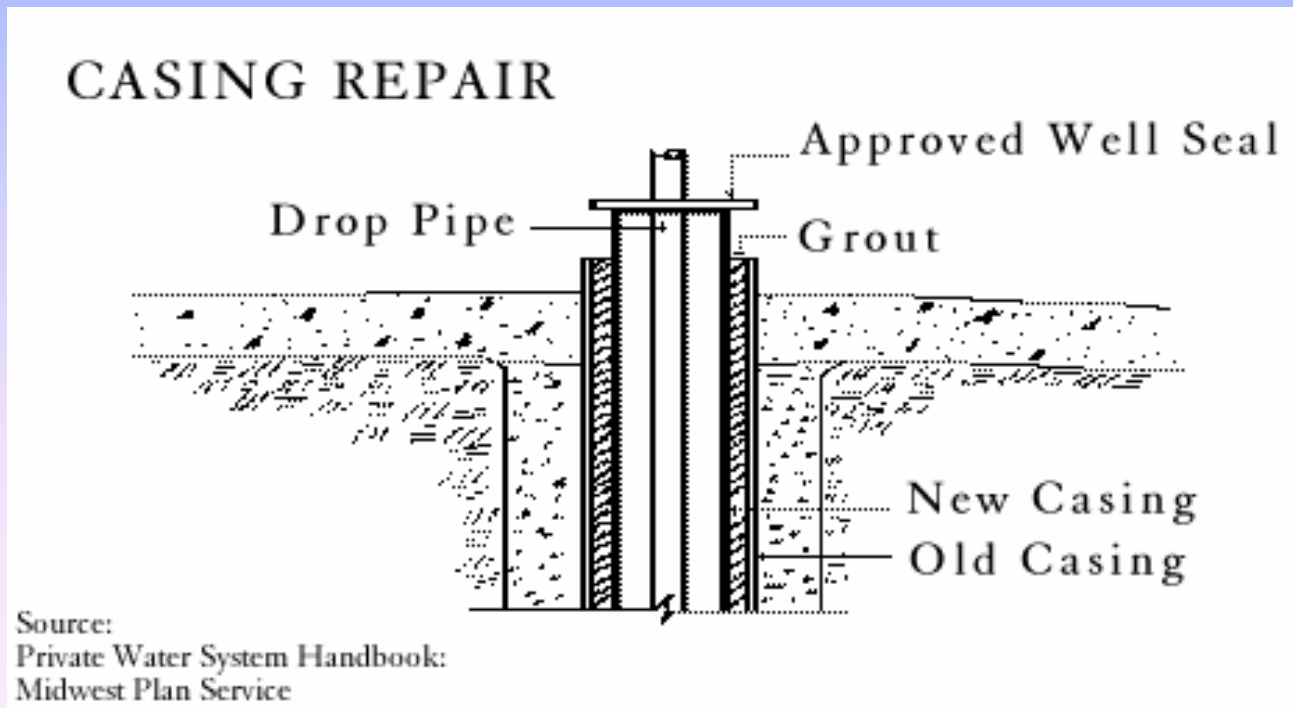
Upper Occoquan Sewage Authority

Regional Agencies

MWCOG

What does a “Bacteria Impairment” mean to me?

Have your well tested and repaired if it is aging and you are concerned.



Previous Bacteria Standard

Indicator species: fecal coliform

Instantaneous max:

1,000 cfu/100 mL

- Applicable for data sets with 1 or fewer samples in 30 days
- Used in **water quality assessment** because monitoring is usually conducted bimonthly

Geometric mean:

200 cfu/100 mL

- Applicable for data sets with 2 or more samples in 30 days
- Used in **TMDL development** because model output is usually daily

Interim Bacteria Standard

New **fecal coliform** criteria:

- interim criteria necessary for transition from fecal coliform to *E. coli*
- will be phased out when 12 *E. coli* observations available or after June 30, 2008

Instantaneous max:

400 cfu/100 mL

Applicable for all data sets; no more than 10% of samples in a calendar month may exceed the maximum

Geometric mean:

200 cfu/100 mL

Applicable for data sets with 2 or more samples in a calendar month

Applicable Bacteria Standard

New indicator species: *E. coli*

Instantaneous max:

235 cfu/100 mL

Applicable for all data sets; no samples may exceed the maximum

Geometric mean:

126 cfu/100 mL

Applicable for data sets with 2 or more samples in a calendar month

**Note: The Occoquan
Reservoir,
a major drinking water
source, fully supports its
designated use as public
water supply.**

**(The Reservoir is deemed “impaired”
for aquatic life criteria, and a TMDL will
be conducted soon.)**

What does a “Bacteria Impairment” mean to me?

Individual drinking water wells

According to VDH:

- Individual drinking water wells installed since 1962 meet new standards - such wells are very unlikely to be contaminated.
- Older individual drinking water wells could receive bacteria contamination from surface flow, if the well casing is cracked or loose.
- Have your well water tested annually, especially if you are concerned.